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Dr. Franz Werner, in *Verhandl. zool. bot. Gesell. Wien*, xlviii, 1, gives an interesting summary of our knowledge regarding the breeding habits of amphibians. The author calls attention to the fact that most of the forms inhabit tropical America. A bibliography is appended.

It appears from a recent number of the *Mededeelingen van het Proefstation Oost-Java* that in that part of the world tailor birds are found to be injurious to the fields of sugar cane.

The recent discovery by Mr. James P. Hill,<sup>1</sup> that the marsupial genus *Perameles* has a true allantoic placenta, is one of the most important in regard to the mammals in recent years, possibly since the discovery of the oviparous nature of the monotremes, pointing, as it does, to the idea that the marsupials have descended from a placental stock.

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## BOTANY.

**The Floral Plan of the Cruciferae.** — When the great number, wide distribution, and habital diversity of the Cruciferae are considered, it is remarkable that the floral structure is well-nigh constant throughout the whole family. So uniform, in fact, are the flowers that the systematist has always been puzzled to find in them clear or satisfactory distinctions for tribal subdivision. Within a four-membered calyx are four petals, alternating with the sepals, then two short lateral stamens, two pairs of longer, somewhat approximated stamens approaching the median line, and, finally, a two-celled gynæcium with lateral valves and median "false" septum. Departures from this well-known plan are chiefly of the nature of simplification through reduction or abortion of parts.

On a casual inspection, the typical cruciferous flower would seem to be simple enough except in its hexandrous androecium, but its plan, even after exhaustive research and prolonged discussion, is still a matter of doubt, and each whorl of floral organs has been subject to widely divergent interpretation. Among the numerous investigators, who have published upon the cruciferous flower, may be mentioned A. P. De Candolle, Kunth, Bernhardt, Steinheil, Hochstetter, Krause, Wydler, Payer, Chatin, Godron, Eichler, Duchartre, Wretschko, Fournier, Engler, Klein, Celakowski, Chodat, and Lignier. Of these

<sup>1</sup> *Quar. Journ. Micros. Sci.*, vol. xl, p. 385.

writers, Eichler has, after an admirable summary of previous work upon the subject, stated the simplest and perhaps most convincing plan. His diagram, which has in recent years met with pretty wide acceptance, is as follows: the calyx consists of two dimerous alternating whorls; the corolla of a single tetramerous whorl, of which the parts alternate with the sepals taken together; the andrœcium of two dimerous whorls (the members of the inner being doubled by division), and the gynoecium of two laterally placed carpels.

This theory is too well known and has been too carefully grounded to need any explanation or defense here. In recent years, however, three more or less divergent views have been expressed by Klein, Celakowski, and Lignier. Passing over some slight points, one may say that the plan of Klein differs from that of Eichler in maintaining a tetramerous inner whorl of stamens and a four-carpelled gynoecium, in which not only the two valves, but also the two placenta-bearing columns of the replum, represent carpels. Celakowski, however, believes the andrœcium to be derived from two tetramerous alternating whorls, the outer of which has lost two of its members by abortion. He agrees with Eichler and most of the earlier writers in regarding the gynoecium as fundamentally bicarpellary.

Lignier<sup>1</sup> has suggested a theory of which the ingenuity is only exceeded by the disregard for facts. He supposes the flower to consist of only four alternating dimerous whorls. The first consists of the two outer sepals, which he believes lateral. Then follow the two median sepals, which he regards as three-parted, the green sepal being the central part of each and the two adjacent petals being the lateral parts or lobes of the sepals. Similarly, the short stamens are regarded merely as the middle lobes of trifid members, of which the adjacent longer stamens represent the lateral parts. Even in the gynoecium Lignier endeavors to show connate three-parted members, since he regards the placenta as the central lobes and the valves as composed of the connate lateral lobes of two carpels!

The latest publication upon the cruciferous flower is that of Chodat and Lendner.<sup>2</sup>

These authors have made a detailed examination of the floral development, especially as to the course of the fibro-vascular bundles, and devote some space to a refutation of Lignier's theory, — a matter of no great difficulty for any one reasonably conversant with the early stages of the cruciferous flower. The argument is chiefly

<sup>1</sup> *Compt. rendus. Acad. Sci.*, pp. 675-678, 1895.

<sup>2</sup> *Bull. de l'Herb. Boiss.*, v., pp. 925-938, November, 1897.

to the effect that the corolla arises as a distinct whorl of organs which are formed later than the inner sepals and receive bundles which leave the axis at a higher point. In the same way the long stamens are shown to be a distinct whorl and in no sense appendages of the shorter ones.

Chodat and Lendner agree in nearly all points with the view of Klein, and argue that the seemingly bicarpellary gynœcium of the normal Cruciferae is in reality due to the union of four carpellary members. This view is based chiefly upon the course of the bundles in certain anomalous three- or four-carpelled specimens of *Cheiranthus cheiri* L. It is scarcely necessary to say that a conclusion from these rather doubtful premises must be accepted with all due caution.

B. L. R.

**Zinsser on Root Tubercles of Leguminosæ.**—In *Jahrb. f. wiss. Bot.*, Bd. xxx, Heft 4, pp. 423–452, may be found an interesting paper by O. Zinsser on the root tubercles of the Leguminosæ. This paper contradicts some of the statements of Frank, Gonnermann, Laurent, etc., especially the statement that the root tubercle organism occurs outside of the tubercles in various parts of the plant. This work was done in the Botanical Institute at Leipzig. The following are some of the more important statements :

1. Seeds of all sorts of leguminous plants were washed in sterile water, soaked fifteen minutes in water containing mercuric chloride (1 : 1000), washed again thoroughly in sterile water, planted in sterile earth, covered with cotton-plugged sterile bell jars, and watered with sterile water. The plants which grew from these seeds were under observation eight to twelve weeks, but in no case did any tubercles form on their roots. If, however, the contents of root tubercles of these same plants was added to the earth, tubercles developed on the roots in most cases in fourteen days. The author believes with Prazmowski that Dr. Frank's diametrically opposite results were due to the fact that he did not succeed in freeing his seeds from adhering surface organisms. So far as could be detected, the sublimate treatment did not in any way injure the plants.

2. Other aërial parts and roots destitute of tubercles were then tested in various ways for the occurrence of the germ :

(a) Approved staining methods, *e.g.*, carbol fuchsin, alkaline methylen blue, gentian violet in anilin water, etc., were used on sections, but in no case could bacteria be demonstrated in the tissues.